

Appl. No. 10/010,858
 Response to Restriction/Election dated August 11, 2004
 Reply to Office Action of June 24, 2004

Amendments to the Claims:

This listing of claims will replace all prior versions, and listing, of claims in the application:

Listing of Claims:

- 1 1. (original) An electrode material comprising a surface/chemically modified
 2 positive electrode (cathode) material, wherein the surface/chemical modification is a
 3 ceramic.

- 1 2. (currently amended) The composition of claim 1, wherein the surface/chemical
 2 modification is selected from the group consisting of $\text{Li}_x\text{Ni}_{1-y}\text{M}_y\text{O}_2$, where $0 \leq x \leq 1$, 0
 3 $\leq y \leq 1$, and $\text{M} = \text{Mg}, \text{Al}, \text{Ti}, \text{V}, \text{Cr}, \text{Fe}, \text{Co}, \text{Cu}, \text{Zn}$, and Ga ; Al_2O_3 ; Cr_2O_3 ; MgO ; Al_2
 4 $\text{Mg}_2\text{O}_{2-0.5y}$, where $0 \leq y \leq 2$; $\text{Li}_{1-x}\text{Mn}_{2-x-y}\text{M}_y\text{O}_4$, where $0 \leq x \leq 0.33$, $0 \leq y \leq 2$ and $\text{M} =$
 5 $\text{Mg}, \text{Al}, \text{Ti}, \text{V}, \text{Cr}, \text{Fe}, \text{Co}, \text{Ni}, \text{Cu}$ and Zn ; $\text{Zr}_{1-y}\text{M}_y\text{O}_2$, where $0 \leq y \leq 1$ and $\text{M} = \text{Mg},$
 6 $\text{Ca}, \text{Zr}, \text{M}_y\text{O}_{2-0.5y}$, where $0 \leq y \leq 1$ and $\text{M} = \text{Sr}, \text{Y}$; and a combinations thereof.

- 1 3. (currently amended) The composition of claim 1, wherein the positive electrode
 2 (cathode) material is selected from the group consisting of LiCoO_2 , LiMn_2O_4 , LiNi_{1-y}
 3 Co_yO_2 , where $0 \leq y \leq 1$ and $\text{LiMn}_{1-y}\text{M}_y\text{O}_2$, where $\text{M} = \text{Cr}$ and Al and $0 \leq y \leq 1$, and
 4 $\text{Li}_{1-x}\text{Mn}_{2-x-y}\text{M}_y\text{O}_{4-2+0.5x}$, where $0 \leq x \leq 0.33$, $0 \leq y \leq 1$, $0 \leq \delta \leq 0.5$, $\text{M} = \text{Mg}, \text{Al}, \text{Ti}, \text{V},$
 5 $\text{Cr}, \text{Fe}, \text{Co}, \text{Ni}, \text{Cu}$ and Zn , and $\text{X} = \text{F}$ and S .

- 1 4. (canceled)

- 1 5. (withdrawn) The composition of claim 1, wherein the positive electrode
 2 (cathode) material is LiCoO_2 .

- 1 6. (original) The composition of claim 1, wherein the surface/chemical
 2 modification material is $\text{Li}_x\text{Ni}_{1-y}\text{Co}_y\text{O}_2$, where $0 \leq x \leq 1$; $0 \leq y \leq 1$.

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- 1 7. (withdrawn) The composition of claim 1, wherein the surface/chemical
2 modification material is Al_2O_3 .
- 1 8. (withdrawn) The composition of claim 1, wherein the surface/chemical
2 modification material is MgO .
- 1 9. (withdrawn) The composition of claim 1, wherein the surface/chemical
2 modification material is MgAl_2O_4 .
- 1 10. (original) The composition of claim 1, wherein the surface/chemical
2 modification material is $\text{Li}_{1.05}\text{Mn}_{1.9}\text{Ni}_{0.05}\text{O}_4$.
- 1 11. (withdrawn) The composition of claim 1, wherein the surface/chemical
2 modification material is Cr_2O_3 .
- 1 12. (currently amended) An electrode material comprising a LiMn_2O_4 spinel oxide
2 having been surface/chemically modified with a surface/chemical modification material
3 ~~selected from the group consisting of $\text{Li}_x\text{Ni}_{1-y}\text{Co}_y\text{O}_2$, where $0 \leq x \leq 1$; $0 \leq y \leq 1$; Al_2O_3 ;~~
4 ~~Cr_2O_3 ; MgO ; MgAl_2O_4 ; and a combinations thereof.~~
- 1 13. (original) The composition of claim 11, wherein the surface/chemical
2 modification material is $\text{Li}_x\text{Ni}_{1-y}\text{Co}_y\text{O}_2$, where $0 \leq x \leq 1$; $0 \leq y \leq 1$.
- 1 14. (withdrawn) The composition of claim 11, wherein the surface/chemical
2 modification material is Al_2O_3 .
- 1 15. (withdrawn) The composition of claim 11, wherein the surface/chemical
2 modification material is MgO .
- 1 16. (withdrawn) The composition of claim 11, wherein the surface/chemical
2 modification material is MgAl_2O_4 .

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- 1 17. (withdrawn) The composition of claim 11, wherein the surface/chemical
2 modification material is Cr_2O_3 .
- 1 18. (original) An electrode material comprising a LiCoO_2 layered oxide having
2 been surface/chemically modified with a surface/chemical modification material
3 ~~selected from the group consisting of Al_2O_3 , Cr_2O_3 , MgO , MgAl_2O_4 , $\text{Li}_{1+x}\text{Mn}_{2-x-y}\text{M}_y\text{O}_4$~~
4 where $0 \leq x \leq 0.33$, $0 \leq y \leq 2$ and $\text{M} = \text{Ni}$ or Co ; ~~and a combinations thereof.~~
- 1 19. (withdrawn) The composition of claim 17, wherein the surface modification
2 material is Al_2O_3 .
- 1 20. (original) The composition of claim 17, wherein the surface modification
2 material is $\text{Li}_{1.05}\text{Mn}_{1.9}\text{Ni}_{0.05}\text{O}_4$.
- 1 21. (withdrawn) An electrode material preparation method comprising:
2 supplying a LiMn_2O_4 spinel oxide electrode material;
3 mixing the LiMn_2O_4 spinel oxide electrode material with a surface/chemical
4 modification material selected from a group consisting of $\text{Li}_x\text{Ni}_{1-y}\text{Co}_y\text{O}_2$, where $0 \leq x \leq$
5 1 ; $0 \leq y \leq 1$; Al_2O_3 ; Cr_2O_3 ; MgO ; MgAl_2O_4 ; and combinations thereof; and
6 heat-treating the mixture to prepare a surface/chemically modified LiMn_2O_4
7 electrode material.
- 1 22. (withdrawn) The method of claim 20, wherein the heat-treating is performed at
2 a temperature in the approximate range of 100°C to 1000°C .
- 1 23. (withdrawn) The method of claim 20 wherein the heat-treating is performed for
2 approximately 1 to 24 hours.
- 1 24. (withdrawn) The method of claim 20, wherein the surface/chemical
2 modification material is in the approximate range of 1 to 20 weight percent of the
3 surface/chemically modified LiMn_2O_4 electrode material.

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1 25. (currently amended) An electrode material comprising a surface/chemically
2 modified LiMn_2O_4 spinel oxide said electrode material prepared by a process
3 comprising:

4 a) refluxion of a precursor solution in glacial acetic acid, wherein the precursor
5 is selected from a group consisting of Li_xCoO_2 , $\text{LiCo}_{0.5}\text{Ni}_{0.5}\text{O}_2$, and Al_2O_3 ;

6 b) preparing a precursor solution in water, wherein the precursor is selected
7 from a group consisting of Al_2O_3 , Cr_2O_3 , MgO , and MgAl_2O_4 ;

8 c) dispersing LiMn_2O_4 spinel oxide in the precursor solution; and

9 d) heating the dispersed LiMn_2O_4 spinel oxide to approximately 100 to 500
10 degrees C; and

11 e) firing the heated dispersed LiMn_2O_4 spinel oxide at 500 to 900 degrees C.

1 26. (withdrawn) A method of preparing an electrode material for lithium-ion
2 batteries comprising:

3 supplying a LiCoO_2 layered oxide electrode material;

4 mixing the LiCoO_2 layered oxide electrode material with a surface/chemical
5 modification material selected from a group consisting of Al_2O_3 , Cr_2O_3 , MgO ,
6 MgAl_2O_4 , $\text{Li}_{1+x}\text{Mn}_{2-x-y}\text{M}_y\text{O}_4$ where $0 \leq x \leq 0.33$, $0 \leq y \leq 2$ and $\text{M} = \text{Ni}$ or Co ; and
7 combinations thereof; and

8 heat-treating the mixture to prepare a surface/chemically modified LiCoO_2
9 electrode material.

1 27. (withdrawn) The method of claim 23, wherein the heat-treating is performed at
2 a temperature in the approximate range of 100°C to 1000°C .

1 28. (withdrawn) The method of claim 23 wherein the heat-treating is performed for
2 approximately 1 to 24 hours.

1 29. (withdrawn) The method of claim 25, wherein the surface/chemical
2 modification material is in the approximate range of 1 to 20 weight percent of the
3 surface/chemically modified LiCoO_2 electrode material.

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- 1 30. (currently amended) An electrode material comprising a surface/chemically
2 modified LiCoO_2 layered oxide said electrode material prepared by a process comprising:
3 a) refluxion of a precursor solution in glacial acetic acid, wherein the precursor is
4 ~~selected from a group consisting of Al_2O_3 , Cr_2O_3 , MgO , MgAl_2O_4 , $\text{Li}_{1+x}\text{Mn}_{2-x-y}\text{M}_y\text{O}_4$~~
5 where $0 \leq x \leq 0.33$, $0 \leq y \leq 2$ and $\text{M} = \text{Ni}$ or Co ;
6 b) preparing a precursor solution in water, wherein the precursor is selected from
7 a group consisting of Al_2O_3 , Cr_2O_3 , MgO , and MgAl_2O_4 ;
8 c) dispersing LiCoO_2 layered oxide in the precursor solution; and
9 d) heating the dispersed LiCoO_2 layered oxide to approximately 100 to 500
10 degrees C; and
11 e) firing the heated dispersed LiCoO_2 layered oxide at 500-900 degrees C.